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Rasbora rheophila, a new species of fish from northern Borneo (Teleostei: Cyprinidae)

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***Rasbora rheophila*, a new species of fish from northern Borneo (Teleostei: Cyprinidae).** - *Rasbora rheophila*, new species, is described from Borneo in Sabah (Malaysia) and northern Kalimantan Timur (Indonesia). It is distinguished from all other species of the genus by the combination of a slender body, the backward position of the dorsal fin, a rounded snout, a dark midlateral stripe from head to end of hypural plate, over the axial streak, the caudal fin with a greyish to black posterior margin, restricted to upper lobe in some populations, 14 circumpeduncular scale rows, 31-34 + 2-3 lateral line scales, and 18-19 + 18-20 = 36-38 vertebrae.

Keywords: *Rasbora* - Borneo - Malaysia - Sabah - Indonesia - Kalimantan Timur.

INTRODUCTION

The genus *Rasbora* includes small cyprinid fishes found throughout South and Southeast Asia. The genus presently includes some 120 valid species, of which many have been discovered in the last 20 years (see, e.g., Hadiaty & Kottelat, 2009; Tan, 1999, 2009; Kottelat, 1991, 1995, 2000, 2005, 2008; Kottelat & Tan, 2011; Lumbantoging, 2010). I describe here a new species from northeastern Borneo.

MATERIAL AND METHODS

Material examined is deposited in: IRSNB, Institut Royal des Sciences Naturelles de Belgique, Bruxelles; MHNG, Muséum d'Histoire Naturelle, Genève; RMNH, Nationaal Natuurhistorisch Museum, Leiden; ZRC, Raffles Museum of Biodiversity Research, National University of Singapore; and CMK, the collection of the author. Specimens were measured on the left side using dial callipers (accuracy 0.1 mm). Meristic and measurements were taken according to Kottelat (2001) and Kottelat & Freyhof (2007). Vertebrae counts follow Roberts (1989). SL is standard length.

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SYSTEMATIC PART

***Rasbora rheophila*, new species** Figs. 1-2

Rasbora cf. *sumatrana* 1: Kottelat & Vidthayanon, 1993: 164.

HOLOTYPE: IRSNB 874, 59.4 mm SL; Borneo: Sabah: Sungai Pangakatan (a tributary of Sungai Liwagu), near Ranau on road to hot spring; Leopold III & J. P. Gosse, 8 October 1971.

PARATYPES: IRSNB 875 [ex 17554], 83, 37.8-58.8 mm SL; CMK 21901, 10, 39.7-58.3 mm SL; same data as holotype. – CMK 9461, 5, 20.0-57.5 mm SL; Borneo: Kalimantan Timur: Sebuku drainage: Sungai Bantul at Bantul logging camp, draining to Tulit; 4°08.9'N 116°48.3'E; M. Kottelat & P. McKee, 10 February 1993. – MHNG 2542.37, 9, 20.1-39.0 mm SL; Borneo: Sabah: Long Pa Sia; about 60 km South-East of Lawas, 135 km south of Beaufort, tributary of Sungai Padas; 4°25'N 115°43'E; J. Binggeli, October 1992. – ZRC 47505, 1, 68.4 mm SL; Borneo: Sabah: Kota Marudu: Marak Parak, Sungai Kinarom, Kampung Loguhang, about 6 km downstream of Serinsim Station (6°19.733'N 116°44.403'E, 120 m asl); Tan H. H. et al., 15 December 2000.

DIAGNOSIS: *Rasbora rheophila* is distinguished from all its congeners by the combination of the following characters: body slender, depth 21-25 % SL (4.0-4.7 times in SL); predorsal length 49-56 % SL, dorso-hypural distance, when carried forward, falling before nostrils; 14 circumpeduncular scale rows; 31-34 + 2-3 lateral line scales; rounded snout; a dark lateral stripe from head to end of hypural plate, over axial streak; caudal fin with a greyish to black posterior margin, restricted to upper lobe in some populations; caudal peduncle 1.9-2.2 times longer than deep; 18-19 + 18-20 = 36-38 vertebrae.

DESCRIPTION: General appearance is shown in Figures 1-2 and morphometric data of holotype and 8 paratypes are given in Table 1. Dorsal fin with 2 simple and 7-8½ branched rays; origin above lateral line scale 12 (1), 13 (7) or14 (2). Pectoral fin slightly falcate, with 14-16 rays; a small axillary lobe present. Pelvic fin slightly pointed, with 9 rays; axillary scale present. Anal fin with 3 simple and 5½ branched rays. Caudal fin with 10+9 principal rays, 9+8 being branched. Caudal peduncle 1.94-2.24 times longer than deep. 31 (1), 32 (2), 33 (4) or 34 (2) scales along lateral line + 2-3 pored scales on caudal-fin base. Lateral line complete. 12 (1), 13 (5) or 14 (4) predorsal scales, ½4/1/2½ scales in transverse line, ½4/1/1½ scales in transverse line on caudal peduncle (½5/1/1½ in holotype), 1½ scales between lateral line and pelvic-fin origin. Vertebral formula: 18+18=36 (1), 18+19=37 (4), 18+20=38 (1), 19+18=37 (5), and 19+19=38 (8) (from Kottelat & Vidthayanon, 1993: 164). A few scattered and irregularly shaped tubercles on lower jaw of Sebuku specimens.

COLORATION: The colour pattern of the Pangakatan and Sebuku populations are illustrated in Figures 1-2. A dark stripe from head to end of hypural plate, over axial streak. Axial streak extending forward to gill opening. Lateral stripe black below axial streak and much paler, brownish or greyish, above. A blackish mid-dorsal stripe from nape to caudal-fin base. Dorsum greyish, with crescentic paler marks parallel to posterior scale margins. A narrow and faint line of black pigments above anal-fin base. Belly pale yellowish, with a few brown crescentic marks on anterior medio-lateral scales. In Sebuku specimens, caudal fin with a dark grey posterior margin, broader near the tip of the lobes; in Pangakatan specimens, margin narrow or absent on lower lobe and broader and more intense on upper lobe. In Kinarom specimen, margin very faint on lower lobe and narrow on upper lobe. Other fins hyaline. The paler coloration of

FIG. 1

Rasbora rheophila, Borneo: Sabah: Ranau; a, IRSNB 874, holotype, 59.4 mm SL (photographed in 2011); b, CMK 21901, paratype, 58.3 mm SL (photographed in 1985).

FIG. 2

Rasbora rheophila, CMK 9641, paratype, 57.5 mm SL; Borneo: Kalimantan Timur: Sebuku drainage.

specimen in Figure 2 compared to that in Figure 1b is apparently due to it having been collected in a rainy period in murky water.

Live coloration not observed due to very heavy rains at time of collecting of Sebuku specimens. When first observed at day light (following day), specimens with same colour pattern as described above.

DISTRIBUTION: *Rasbora rheophila* is known from Sabah (Labuk, Padas and Kinarom drainages) and Kalimantan Timur (Sebuku drainage) (Fig. 3). It is expected

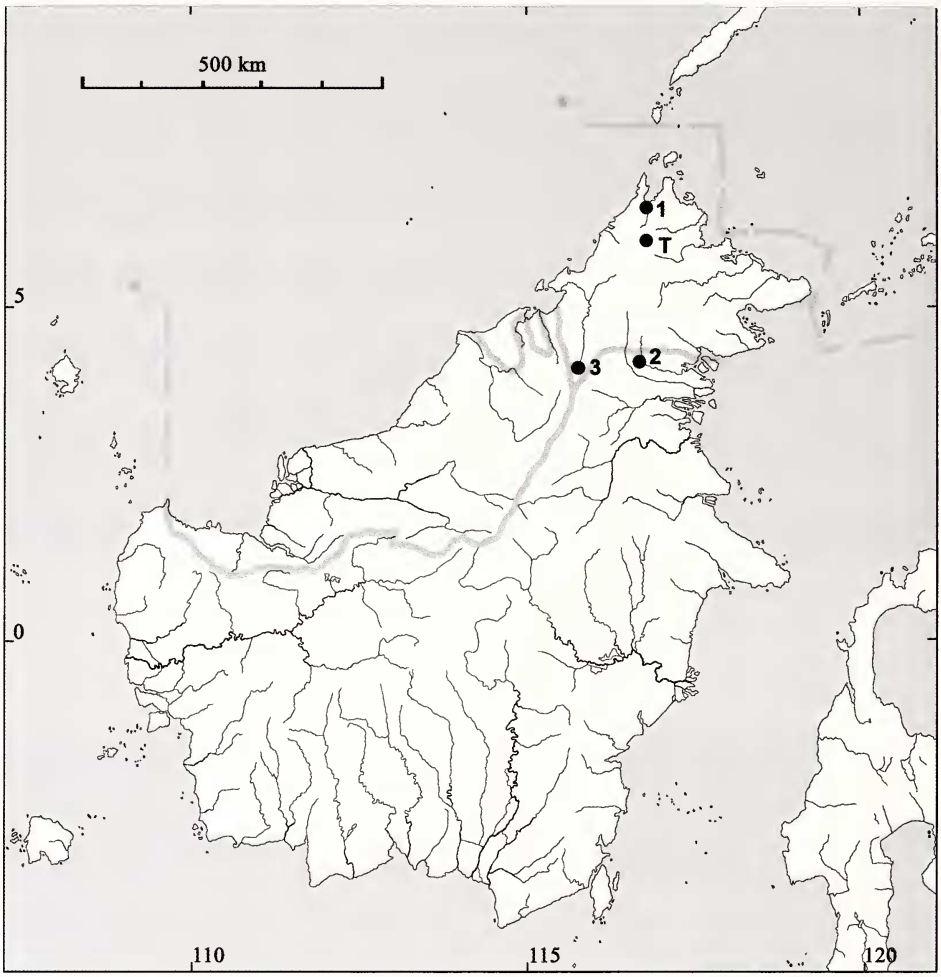

FIG. 3
Borneo, showing known localities of *Rasbora rheophila*. T, type locality (Ranau); 1, Marudu; 2, Sebuku; and 3, Long Pa Sia.

to occur in the headwaters of other drainages of Sabah, as well as in the northernmost part of Kalimantan Timur (for example in Sembakung drainage, which originates in Sabah).

HABITAT: The Sebuku specimens were obtained from a high gradient mountain stream in a large and deep pool somewhat isolated from the main stream and with counter current. The Ranau specimens were collected at an altitude of ca. 550 masl. The Kinarom specimen was collected at 120 masl, in a fast flowing hill stream draining from the northern area of Mount Kinabalu.

ETYMOLOGY: From the Greek *rheos*, stream and *philos*, loving. Treated as an adjective.

REMARKS: The known populations of *R. rheophila* differ slightly in coloration of the caudal fin (see above and Figs. 1-2), head length and predorsal length (see Table 1). Part of the differences in coloration (not pattern) between the specimens on Figures 1 and 2 results from the holotype having been fixed about 14 (Fig. 1b) and 40 years (Fig. 1b) before photography and stored in ethanol denaturated with campher, while the specimen in Figure 2 was photographed about 2 weeks after fixation, while still in formalin. Also, this last specimen was collected in a rainy period and in murky water, while the intensity of the pattern of the specimens in Figure 1b suggests that they were collected in clear water. I cannot, however, exclude the possibility that they actually might represent two species. Samples from intermediate areas are needed to investigate this possibility.

I have observed that the fish populations from eastern and northern Borneo show much greater interdrainage variation than those of the remaining drainages of the island. This seems to reflect more difficult connections between the drainages. During glacial periods, when the sea level decreased and exposed the Sunda Shelf around western and southern Borneo and between Borneo, Java, Sumatra and the Malay Peninsula, connections were established between these rivers, resulting in a few large drainages (Molengraaff & Weber, 1919; de Beaufort, 1951; Sathiamurthy & Voris, 2006), allowing gene flow and contributing to retain some homogeneity within species. Along the coasts of eastern and northern Borneo, the continental shelf is very narrow and the structure of the river network is quite simple, made of many relatively short rivers. Even with the lowered sea level, these small river drainages remained largely unconnected during glacial periods, allowing differentiation of the respective populations. In several cases, the apparent random interdrainage variability observed today is likely to turn out as interspecific differences when more material will become available (more samples from each drainage, and from several localities within each drainage). Similar variability patterns have been observed in *Puntius sealei* (Herre, 1933), *Nematabramis* spp., *Glyptothorax* spp., *Nemacheilus longipectoralis* Popta, 1905, *N. olivaceus* Boulenger, 1894, etc. (pers. obs.). The same mechanism also explains the high endemism level in the drainages of the southwestern (Indian Ocean) slope of Sumatra (e.g. Ng & Hadiaty, 2005, 2008; Hadiaty & Siebert, 1998, 2001; Lumbantobing, 2010) or allows to predict that dozens of species still await discovery in the many coastal drainages isolated by steep hills and the absence of continental shelf.

Using Brittan's (1954: 205) key, *R. rheophila* falls within a group of species with 14 circumpeduncular scale rows, the dorso-hypural distance falling in front of the posterior margin of the eye when carried forward, 1 or 1½ scale row between the lateral line and the origin of the pelvic fin and a continuous dark midlateral stripe from the gill opening to the base of the caudal fin. This group includes *R. myersi* Brittan, 1954 (erroneously synonymised with *R. dusonensis* (Bleeker, 1850) by Kottelat, 1991: 187), *R. argyrotaenia* (Bleeker, 1849) and *R. philippina* (Günther, 1864). *Rabora hubbsi* Brittan, 1954 also has 14 circumpeduncular scales rows, the dorso-hypural distance falling at or in front of the tip of the snout, 1½ scale rows between the lateral line and the origin of the pelvic fin, but the midlateral stripe is more intense posteriorly, with an abrupt transition to the much diffuse anterior portion (vs. equal intensity along whole

TABLE 1. *Rasbora rheophila*, morphometric data of holotype (IRSNB 874) and 8 paratypes.

	IRSNB 874	IRSNB 875				CMK 9461			
Standard length (mm)	59.4	59.1	58.8	58.1	52.0	57.5	57.2	49.7	48.8
Percent of standard length									
Total length	131.3	130.0	138.4	130.3	130.4	133.0	131.1	132.4	132.6
Head length	25.3	25.9	24.9	25.1	25.0	23.7	23.0	23.9	23.8
Predorsal length	52.2	53.1	55.9	52.0	51.7	49.7	49.0	49.7	49.8
Prepelvic length	48.8	48.4	50.5	48.7	47.3	47.5	45.8	47.7	47.1
Preanal length	67.8	67.7	71.7	67.3	65.6	67.0	65.9	66.6	65.8
Body depth at pelvic origin	22.9	25.0	24.7	23.9	21.0	23.8	22.0	21.9	21.7
Depth of caudal peduncle	11.3	11.5	12.2	11.5	11.0	11.8	11.5	11.7	11.1
Length of caudal peduncle	21.9	25.0	24.9	24.3	23.3	24.0	25.9	23.3	24.6
Body width behind pectoral base	11.4	11.8	2.5	11.9	11.2	11.7	11.5	11.5	11.1
Length of dorsal fin	21.7	20.6	22.9	21.0	22.3	24.9	22.6	24.3	23.4
Length of anal fin	16.5	16.4	17.7	16.5	17.7	19.7	17.5	18.1	18.4
Length of pelvic fin	15.8	15.7	16.5	15.7	15.0	19.0	17.0	17.3	16.4
Length of pectoral fin	19.2	19.1	21.0	19.6	19.2	21.4	19.2	19.9	19.5
Length of upper caudal lobe	30.8	29.8	32.6	30.1	28.3	32.9	31.3	31.8	32.4
Length of median caudal rays	15.5	15.2	14.7	13.6	15.4	17.9	15.0	14.7	16.2
Length of lower caudal lobe	31.6	29.1	33.3	31.3	31.0	38.3	34.6	33.4	31.6
Percent of head length									
Head depth at nape	65	63	65	66	65	65	65	67	68
Snout length	27	27	29	27	28	28	30	29	28
Eye diameter	31	31	32	33	31	33	33	33	32
Interorbital width	32	32	36	32	32	35	36	34	32

length of the stripe or with gradual change in these species) and it belongs to the *R. trifasciata* group. *Rasbora dusonensis* and *R. tornieri* Ahl, 1922 [erroneously synonymised by Kottelat, 1991: 187] also have 14 circumpeduncular scale rows but the dorso-hypural distance falls behind the posterior margin of the eye when carried forward. *Rasbora rheophila* is also distinguished from them by having a hyaline caudal fin with a grayish posterior margin (vs. bright yellow with a broad black margin in *R. dusonensis* and deep red in *R. tornieri*; pers. obs.).

Rasbora rheophila is distinguished from *R. philippina*, a species endemic to Mindanao, Philippines, by its slender body (depth 4.0-4.7 times in SL, vs. 3.1-3.8; Brittan, 1954: 128) and a different appearance (see Brittan, 1954: 128, fig. 28).

As presently recognised, *R. argyrotaenia* is a species widely distributed in Java, Sumatra, Borneo and the Malay Peninsula (Brittan, 1954). In fact, it is a complex assemblage, which will eventually be shown to include several species (Kottelat & Vidthayanon, 1993). The type locality of *R. argyrotaenia* is in Java, the type series is a composite of several localities and possibly several species. A comparison of material from East Java (an area part of the type locality) with material from southern and eastern Borneo show they are specifically distinct (unpubl., pers.obs.) and that the name *R. vaillantii* (Popta, 1905) (type locality: Borneo: Mahakam drainage) is the oldest available name for the species from Borneo (Fig. 4). The known range of *R. vaillantii* possibly extends in the eastern half of Borneo from the Barito to the Sebuku drainages.

Rasbora rheophila and *R. vaillantii* occur in sympatry in the Sebuku drainage (but not in syntopy). The two species have very different habitats (mountain stream for *R. rheophila*, lowland slow flowing streams and rivers for *R. vaillantii*), they differ in head shape and general appearance (compare Figures 1, 2 and 4), a more forward dorsal fin (dorso-hypural distance, when carried forward, falling in front of nostril, vs. on eye), and number of vertebrae (18-19 + 18-20 = 36-38, vs. 17-18 + 14-15 = 31-33 [Mahakam], 17+16=33 [Sebuku] in *R. vaillantii*]). Material of *R. vaillantii* (identified as *R. argyrotaenia*) and *R. laticlavia* from the Barito also has 32-34 total vertebrae (Siebert & Richardson, 1997). *Rasbora rheophila* also differs from *R. vaillantii* by the structure of the midlateral stripe. In *R. rheophila* the midlateral stripe is made of a black or dark brown part below the axial streak, and a grey part above. This corresponds to the dark lateral stripe and dorso-lateral stripe, respectively, of Brittan (1954). These two stripes are contiguous, while in most other species of *Rasbora* the two stripes are separated by a paler stripe. In *R. vaillantii*, the dorso-lateral stripe is very narrow, indistinct posteriorly and separated from the 'dark lateral stripe' by a narrow paler area).

Rasbora rheophila differs from *R. myersi*, also a species widely distributed in Southeast Asia but apparently absent from northern and eastern Borneo, by having a slender body (depth 4.0-4.7 times in SL, vs. 3.4-4.6), more vertebrae (18-19 + 18-20 = 36-38, vs. 16-19 + 13-15 = 31-33), a more rounded head, more forward dorsal fin (dorso-hypural distance, when carried forward, falling in front of nostril, vs. on eye), and more lateral line scales (31-34 + 2-3, vs. 29-31 + 2-3). Morphometric data of *R. myersi* are from Brittan (1954: 119).

Rasbora borneensis Bleeker, 1860, was considered a synonym of *R. argyrotaenia* by Brittan (1954) and revalidated by Roberts (1989: 71). It is also a slender

FIG. 4
Rasbora vaillantii, CMK 9523, 69.7 mm SL mm SL; Borneo: Kalimantan Timur: Sebuku drainage.

species with relatively small head. *Rasbora rheophila* is distinguished from *R. borneensis* by having more vertebrae (18-19 + 18-20 = 36-38, vs. 18-19 + 16-17 = 35), a more rounded head, a very narrow adipose eye-lid (vs. broad), more forward dorsal fin (dorso-hypural distance, when carried forward, falling in front of nostril, vs. on eye or just behind), fewer predorsal scales (12-14, vs. 15-16), a somewhat longer head (3.9-4.3 times in SL, vs. 4.2-4.5; Roberts, 1989: 72), and structure of the midlateral stripe (black lower half adjacent to axial streak on all its length, vs. running slightly below axial streak in front of dorsal-fin origin). *Rasbora leptosoma* (Bleeker, 1855), described from Lahat (Sumatra) and known only from two poorly preserved syntypes, is possibly a senior synonym of *R. borneensis* but fresh topotypes are needed to reach a reliable conclusion.

Rasbora rheophila shares with *R. volzii* Popta, 1905 (Fig. 5) and *R. everetti* Boulenger, 1895 (Fig. 6) the vertebrae count of 36-38; all other species of the *R. sumatrana* group have 31-35 (see Kottelat & Vidthayanon, 1993, for vertebrae counts of most species of *Rasbora*). *Rasbora rheophila* differs from *R. everetti* by its more rounded snout (compare Figs. 1, 2 and 6) and interorbital area, more lateral line scales (31-34 + 2-3, vs. 27-30 + 2-3), more circumpeduncular scales (14 vs. 12 [14 in a few specimens]), a more backward dorsal fin (dorso-hypural distance, when carried forward, falling before nostrils, vs. between nostril and eye), and the structure of the midlateral stripe (made of a black or dark brown stripe below the axial streak, and a contiguous grey stripe above vs. the black and grey stripes are separated by a narrow pale stripe above the lateral streak).

Rasbora rheophila differs from *R. volzii* by snout shape (compare Figs. 1, 2 and 5), snout length (27-30 % HL, vs. 30-34), interorbital distance (about equal to eye diameter, vs. 1.25-1.5 times eye diameter) and shape (rounded, vs. almost flat), colour pattern made of a continuous stripe (vs. a narrow stripe widened into an elongate blotch on the anterior part of the body and at the posterior extremity of the caudal peduncle), number of circumpeduncular scales (14, vs. 12), distribution of pigments along the posterior margin of the caudal fin (on membranes and rays, vs. on membranes only), and head length (23-26 % SL, vs. 25-27).

FIG. 5
Rasbora volzii, RMNH 7622 [holotype of *R. v. fasciata*], 100.9 mm SL; Borneo: Kalimantan Timur: Kayan drainage.

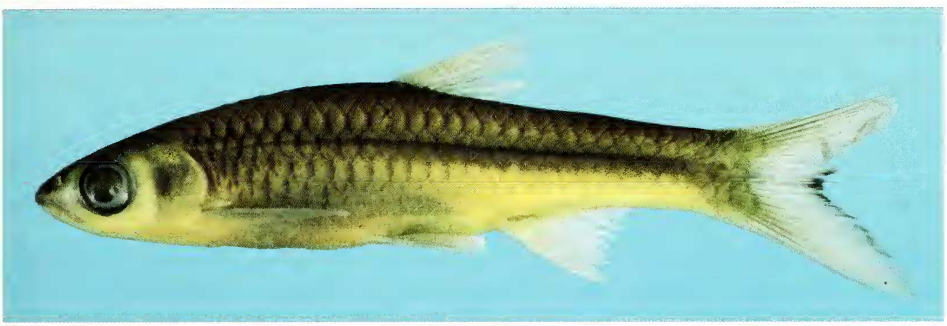

FIG. 6
Rasbora everetti, CMK 11970, 52.9 mm SL; Philippines: Palawan: Malatgao drainage.

COMPARISON MATERIAL: *Rasbora borneensis*: CMK 10460, 1, 64.2 mm SL; Borneo: Kalimantan Barat: Kapuas.

Rasbora dusonensis: CMK 20592, 25, 50.2-72.3 mm SL; Sumatra: Sumatera Selatan: Musi drainage: Sungai Gelam.

Rasbora everetti: CMK 11970, 28, 15.6-53.4 mm SL; CMK 11962, 49, 27.3-45.6 mm SL; Philippines: Palawan: Malatgao River. – CMK 8850, 3, 53.7-68.0 mm SL; Philippines: Palawan: Lake Manguao.

Rasbora leptosoma: RMNH 4981, lectotype, 67.9 mm SL; Sumatra: Lahat.

Rasbora myersi: CMK 10592, 10, 75.8-95.4 mm SL; Borneo: Kalimantan Barat: Kapuas drainage: Sungai Melawi.

Rasbora tornieri: CMK 20593, 28, 39.9-74.1 mm SL; Sumatra: Sumatera Selatan: Musi drainage: Sungai Gelam.

Rasbora vaillantii: CMK 9523, 68, 13.1-69.7 mm SL; Borneo: Kalimantan Timur: Sebuku drainage: Sungai Tulit.

Rasbora volzii: RMNH 7621, 6 syntypes, 45.1-74.1 mm SL; Borneo: Kalimantan Timur: Mahakam drainage, Howong. – RMNH 7620, 4 paralectotypes,

80.7-91.7 mm SL; Borneo: Kalimantan Barat: Kapuas drainage, Bongan. – RMNH 7622, holotype of *R. v. fasciata*, 100.9 mm SL; Borneo: Kalimantan Timur: Kajan [Kayan] drainage. – ZRC 45691, 10, 22.8-78.2 mm SL; Borneo: Kalimantan Timur: Kayan drainage, Sungai Bako. – ZRC 45627, 3, 29.9-115.0 mm SL; Borneo: Kalimantan Timur: Kayan drainage, Bahau, Sungai Batu Bayak. – ZRC 45635, 12, 19.1-86.6 mm SL; Borneo: Kalimantan Timur: Kayan drainage, Bahau, Sungai En'ggeng I'ut. – ZRC 45656, 12, 26.6-89.2 mm SL; Borneo: Kalimantan Timur: Kayan drainage, Bahau, Lalut [= sungai] Birai. – ZRC 47524, 19, 30.2-86.1 mm SL; CMK 17816, 4, 38.2-70.7 mm SL; Borneo: Kalimantan Timur: Kayan drainage, Usat Aran.

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